State of California

Business, Transportation and Housing Agency

Memorandum

To : All Districts

Date : August 17, 1988

Attention Deputy District Directors
Project Development

File No.:

Ken Bandow, Chief
Central Design Branch

From : **DEPARTMENT OF TRANSPORTATION**

Subject : Revised Standard Plan D87-C

At the request of the Office of Project Planning and Design the above Revised Standard Plan is being issued. The revised plan corrects the typical details for excavation and backfill of underdrains.

Headquarters will insert the Revised Standard Plan into projects when PS&E submittals indicate that Standard Plan D87-C is applicable to the project.

Attached is an 8-1/2" x 11" print of the Revised Standard Plan, a copy of the revised Standard Plans List and a list of all revisions to the January 1988 Standard Plans book as of July 5, 1988.

Preston W. Kelley

PRESTON W. KELLEY
Office Engineer

Attachments

DIST	COUNTY	ROUTE	POST MILES TOTAL	POST MILES PROJECT	SHEET NO.	TOTAL SHEETS

To accompany plans dated _____

GENERAL ROAD WORK

- ☐ A-10A Abbreviations
- ☐ A-10B Symbols
- ☐ A20-A Pavement Markers and Traffic Lines, Typical Details
- ☐ A20-B Pavement Markers and Traffic Lines, Typical Details
- ☐ A20-C Pavement Markers and Traffic Lines, Typical Details
- ☐ A-24A Pavement Markings — Arrows
- ☐ A-24B Pavement Markings — Arrows and Symbols
- ☐ A-24C Pavement Markings — Words
- ☐ A-24D Pavement Markings — Words and Crosswalks
- ☐ A35-A P.C.C. Paving Details
- ☐ A62-A Excavation and Backfill Miscellaneous — Limits of Payment
- ☐ A62-B Excavation and Backfill Bridge Surcharge and Wall — Limits of Payment
- ☐ A62-C Excavation and Backfill Bridge — Limits of Payment
- ☐ A62-D Excavation and Backfill Details Concrete and Pipe Culverts
- ☐ A62-E Excavation and Backfill Details Reinforced Concrete Box and Arch Culverts
- ☐ A62-F Excavation and Backfill Details Metal Culverts
- ☐ A73 Type III Barricade and Object Markers
- ☐ A74-A Markers and Delineators
- ☐ A74-B Survey Monuments
- ☐ A75-A Concrete Barrier Type 50
- ☐ A75-B Concrete Barrier Type 50
- ☐ A75-C Headlight Glare Screen
- ☐ A77C-1 Metal Beam Guard Railing — Standard Hardware
- ☐ A77C-2 Metal Beam Guard Railing
- ☐ A77-D Barrier and Guard Rail Anchors
- ☐ A77-E Cable Anchor Assembly (Breakaway)
- ☐ A77-F Thrie Beam Barrier
- ☐ A77-G Thrie Beam Barrier
- ☐ A79-A Guard Rail Flares
- ☐ A79-B Miscellaneous Guard Rail Details
- ☐ A79-C Guard Rail Connections to Bridge Rails, Retaining Walls and Abutments
- ☐ A79-D Guard Rail Connections to Bridge Sidewalks and Curbs
- ☐ A79-E Thrie Beam Connection to Type 50 Barrier
- ☐ A80 Emergency Passageways
- ☐ A83 Portable Scale Pad and Approach Slab Details
- ☐ C7-A1 Reinforced Concrete Crib Wall Battered Walls — Type A, B, & C
- ☐ C7-A2 Reinforced Concrete Crib Wall Battered Walls — Type D, E, & F
- ☐ C7-A3 Reinforced Concrete Crib Wall Vertical Walls — Type A, B, & C
- ☐ C7-A4 Reinforced Concrete Crib Wall Vertical Walls — Type D, E, & F
- ☐ C7-A5 Reinforced Concrete Crib Wall Type A, B, C, D, E, & F Header and Stretcher Details
- ☐ C7-B1 Reinforced Concrete Crib Wall Foundation Pressure —Battered Wall
- ☐ C7-B2 Reinforced Concrete Crib Wall Foundation Pressure — Vertical Wall
- ☐ C8-A Steel Crib Wall — Construction Details
- ☐ C8-B Steel Crib Wall — Design Data
- ☐ C8-C Steel Crib Wall — Details
- ☐ C9-A Timber Crib Wall Types A, B, C and D — Construction Details
- ☐ C9-B Timber Crib Wall Types A, B, C and D — Design Data
- ☐ D72 Drainage Inlets — OS, OL, GOL
- ☐ D73 Drainage Inlets — G1, G2, G3, G4, G5, G6
- ☐ D74 Drainage Inlets — GT1, GT2, GT3, GT4, GO, GDO
- ☐ D75 Pipe Inlets
- ☐ D77-A Grate Details
- ☐ D77-B Bicycle Proof Grate Details
- ☐ D78 Gutter Depressions
- ☐ D80 Single Box Culvert
- ☐ D81 Double Box Culvert
- ☐ D83 Box Culvert Miscellaneous Details
- ☐ D84 Box Culvert Wingwalls, Types A, B & C
- ☐ D85 Box Culvert Wingwalls, Types D & E
- ☐ D86-A Box Culvert Warped Wingwalls
- ☐ D86-B Pipe Culvert Headwalls, Endwalls and Warped Wingwalls
- ☐ D86-C Arch Culvert Headwalls, Endwalls and Warped Wingwalls
- ☐ D87-A Overside Drains
- ☐ D87-B Overside Drains
- ☐ *RSP D-87C Underdrains*
- ☐ D88 Construction Loads on Culverts
- ☐ D89 Pipe Headwalls and Strut Details
- ☐ D90 Pipe Culvert Headwalls, Endwalls & Wingwalls Types A, B & C
- ☐ D93 Drainage Inlet Riser Connections
- ☐ D94 Flared End Sections
- ☐ D95 Concrete Arch Culverts
- ☐ D96 Pipe Riser with Debris Rack Cage
- ☐ D97A CMP Coupling Band Details No. 1, Flanged End CSP Channel Coupling Band Details — Downdrains, Standard and Positive Joints
- ☐ D97B-1 CMP Coupling Band Details No. 2, Annular, Reformed End, and Helical Coupling Bands — Downdrains, Standard and Positive Joints
- ☐ D97B-2 CMP Coupling Band Details No. 3, Flanged End CSP Channel Coupling Band Details — Downdrains, Standard and Positive Joints
- ☐ D97C-1 CMP Coupling Band Details No. 4, Universal Coupling Bands Standard and Positive Joints
- ☐ D97C-2 CMP Coupling Band Details No. 5, Universal Coupling Bands Standard and Positive Joints
- ☐ D97D CMP Coupling Details No. 6 — Standard Joint
- ☐ D97E-1 CMP Coupling Details No. 7 — Positive Joint
- ☐ D97E-2 CMP Coupling Details No. 8 — Positive Joints and Downdrains
- ☐ D97-F Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe Standard and Positive Joints
- ☐ D98-A Standard Inlet Structure Shoulder Installation Details and Details of Slotted Drain Connections
- ☐ D98-B 12" Thru 24" Slotted C.S.P. Drain Details
- ☐ D98-C Alternative Hinged Cover for Type OL & OS Inlets and Trash Rack for Type OCP Inlet
- ☐ D98D-1 Structural Section Drainage System Details
- ☐ D98D-2 Edge Drain Outlet and Vent Details
- ☐ D98D-3 Edge Drain Cleanout
- ☐ D98D-4 Cross Drain Interceptor Details
- ☐ F-10 Chain Link Fence
- ☐ F-20 Barbed Wire and Wire Mesh Fence
- ☐ N8-A Curbs, Dikes and Driveways
- ☐ N8-B Wheelchair Ramp Detail No. 1
- ☐ N8-C Wheelchair Ramp Detail No. 2
- ☐ T-10 Traffic Control System for Lane Closure on Freeways and Expressways, Miscellaneous Details
- ☐ T-11 Traffic Control System for Lane Closure on Multilane Conventional Highways, Miscellaneous Details
- ☐ T-12 Traffic Control System for Lane Closure On Multilane Conventional Highways, Miscellaneous Details
- ☐ T-13 Traffic Control System for Lane Closure on Two Lane Conventional Highways
- ☐ T-14 Details for Ramp Closures, Miscellaneous Details

BRIDGE

- ☐ B0-1 Bridge Details
- ☐ B0-3 Bridge Details
- ☐ B0-5 Bridge Details
- ☐ B0-13 Bridge Details
- ☐ B2-3 16" Cast-in-Drilled-Hole Concrete Pipe
- ☐ B2-5 Pile Details — Class 45 and Class 70
- ☐ B2-8 Pile Details — Class 45C and Class 70C
- ☐ B2-9 Load Test Anchor Pile Details
- ☐ B3-1 Retaining Wall — Type 1 H=4'-30'
- ☐ B3-2 Retaining Wall — Type 1 H=32'-36'
- ☐ B3-3 Retaining Wall — Type 1A
- ☐ B3-4 Retaining Wall — Type 2
- ☐ B3-5 Counterfort Retaining Wall — Type 3
- ☐ B3-6 Counterfort Retaining Wall — Type 4
- ☐ B3-7 Retaining Wall — Type 5
- ☐ B3-8 Retaining Wall Details No. 1
- ☐ B3-9 Retaining Wall Details No. 2
- ☐ B3-11 Retaining Wall Type 6 — 6' Max.
- ☐ B6-1 T-Beam Details
- ☐ B6-10 Utility Openings — T-Beam
- ☐ B6-21 Joint Seals
- ☐ B7-1 Box Girder Details
- ☐ B7-5 Deck Drains
- ☐ B7-8 Deck Drains — Types D-1 and D-2
- ☐ B7-10 Utility Opening — Box Girder
- ☐ B7-11 Utilities Details
- ☐ B8-5 Cast-in-Place Prestressed Girder Details
- ☐ B11-7 Chain Link Railing
- ☐ B11-30 Temporary Railing (Type K)
- ☐ B11-47 Cable Railing
- ☐ B11-51 Tubular Hand Railing
- ☐ B11-52 Chain Link Railing Type 7
- ☐ B11-53 Concrete Barrier Type 25
- ☐ B11-54 Concrete Barrier Type 26
- ☐ B13-1 Slope Protection Detail No. 1
- ☐ B13-2 Slope Protection Detail No. 2
- ☐ B14-1 Structural Steel Plate Vehicular Undercrossing
- ☐ B14-2 Structural Steel Plate Arches
- ☐ B14-3 Supply Line and Communication and Sprinkler Control Conduit
- ☐ B14-4 Supply line

SIGNS, SIGNALS & LIGHTING

OVERHEAD SIGNS — TRUSS

- ☐ S1-12 Overhead Signs, Truss, Instructions and Examples
- ☐ S2-11 Overhead Signs, Truss, Single Post Type, Post Type III thru VII
- ☐ S3-11 Overhead Signs, Truss, Two Post Type, Post Type I-S thru VII-S
- ☐ S4-6 Overhead Signs, Truss, Single Post Type, Structural Frame Members
- ☐ S5-6 Overhead Signs, Truss, Two Post Type, Structural Fram Members
- ☐ S6-8 Overhead Signs, Truss, Structural Frame Details
- ☐ S7-8 Overhead Signs, Truss, Frame Juncture Details
- ☐ S8B Overhead Signs, Steel Frame Removable Sign Panel Frames
- ☐ S8-8A Overhead Formed Panel Details for Mounting on Removable Sign Panel Frames
- ☐ S8C Overhead Signs, Truss, Sign Panel Mounting Details Laminated Panel, Type A
- ☐ S8D Overhead Signs, Truss, Removal Sign Panel Frames 110° and 120° Sign Panels
- ☐ S9-12 Overhead Signs, Walkway Details No. 1
- ☐ S10-9 Overhead Signs, Walkway Details No. 2
- ☐ S11-10 Overhead Signs, Walkway Safety Railing Details
- ☐ S13-10 Overhead Signs, Truss, Pile Foundation

OVERHEAD SIGNS — LIGHTWEIGHT

- ☐ S14 A-5 Overhead Signs, Lightweight, Balanced-Single Steel Post Connection and Mounting Details
- ☐ S14B-4 Overhead Signs, Lightweight, Balanced-Single Steel Post Details
- ☐ S15-8 Overhead Signs, Lightweight, Type A, Connection Details
- ☐ S16-7 Overhead Signs, Lightweight, Type B, Connection Details
- ☐ S17-8 Overhead Signs, Lightweight, Type C, Connection Details
- ☐ S18A-6 Overhead Signs, Lightweight, Sign Panel Mounting Details, Laminated Panel, Type A
- ☐ S18B-7 Overhead Signs, Lightweight, Light Fixture Mounting Details
- ☐ S20A-7 Overhead Signs, Lightweight, Post Details
- ☐ S20B-9 Overhead Signs, Lightweight, Foundation

OVERHEAD SIGNS — BOX BEAM CLOSED TRUSS ALTERNATIVE

- ☐ S39-6 Overhead Signs, Box Beam, Closed Truss Alternative Foundation
- ☐ S40A-1 Overhead Signs, Box Beam, Closed Truss Alternative Two Post Type Frame Members
- ☐ S40B-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single and Two Post Type General Frame Details
- ☐ S40C-1 Overhead Signs, Box Beam, Closed Truss Alternative, Ribbed Sheet Metal Details
- ☐ S40D-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Frame Details
- ☐ S40E-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Frame Juncture Details
- ☐ S40F-1 Overhead Signs, Box Beam, Closed Truss Alternative, Two Post Type Post Details
- ☐ S40G-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Type Frame Members
- ☐ S40H-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Frame Details
- ☐ S40I-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Frame Juncture Details
- ☐ S40J-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Cantilever Post Details
- ☐ S40K-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Frame Details
- ☐ S40L-3 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Frame Juncture Details
- ☐ S40M-1 Overhead Signs, Box Beam, Closed Truss Alternative, Single Post Butterfly Post Details

OVERHEAD SIGNS — TUBULAR

- ☐ S40N Overhead Signs, Tubular, Instructions and Examples
- ☐ S40P Overhead Signs, Tubular, Single Post Type Layout and Pipe Selection
- ☐ S40Q Overhead Signs, Tubular, Two Post Type Layout and Pipe Selection
- ☐ S40R Overhead Signs, Tubular, Structural Frame Details No. 1
- ☐ S40S Overhead Signs, Tubular, Structural Frame Details No. 2
- ☐ S40T Overhead Signs, Tubular, Foundation Details

ROADSIDE SIGNS

- ☐ S41-3 Roadside Signs, Typical Installation Details No. 1
- ☐ S42-15 Roadside Signs, Wood Posts, Typical Installation Details No. 2
- ☐ S43-A Roadside Signs, Laminated Wood Box Posts, Typical Installation Details No. 3
- ☐ S43-B Roadside Signs, Steel Post, Typical Installation Details
- ☐ S44-7 Roadside Signs, Typical Installation Details No. 4

SIGNAL AND LIGHTING DETAILS

- ☐ ES-1A Signal and Lighting Details, Symbols and Abbreviations
- ☐ ES-1B Signal and Lighting Details, Symbols and Abbreviations
- ☐ ES-2A Signal and Lighting Details, Service Equipment
- ☐ ES-2B Signal and Lighting Details, Service Equipment
- ☐ ES-2C Signal and Lighting Details, Service Equipment
- ☐ ES-2D Signal and Lighting Details, Service Equipment
- ☐ ES-2E Signal and Lighting Details, Service Equipment and Typical Wiring Diagram
- ☐ ES-3A Signal and Lighting Details, Signal Heads and Mountings
- ☐ ES-3B Signal and Lighting Details, Signal Heads and Mountings
- ☐ ES-3C Signal and Lighting Details, Signal Heads and Mounting
- ☐ ES-3D Signal and Lighting Details, Signal Heads and Mountings
- ☐ ES-3E Signal and Lighting Details, Signal Heads and Mountings
- ☐ ES-4A Signal and Lighting Details, Controller Cabinet Details
- ☐ ES-4B Signal and Lighting Details, Controller Cabinet Details
- ☐ ES-4C Signal and Lighting Details, Controller Cabinet Details
- ☐ ES-5A Signal and Lighting Details, Detectors
- ☐ ES-5B Signal and Lighting Details, Detectors
- ☐ ES-5C Signal and Lighting Details, Detectors
- ☐ ES-5D Signal and Lighting Details, Detectors
- ☐ ES-5E Signal and Lighting Details, Detectors
- ☐ ES-5F Signal and Lighting Details, Pedestrian Barricades
- ☐ ES-6A Signal and Lighting Standards, Type 1 Standards and Pushbutton Posts
- ☐ ES-6B Lighting Standards, Types 15 and 21
- ☐ ES-6D Lighting Standards, Types 30 and 31
- ☐ ES-6DA Lighting Standards, Type 32
- ☐ ES-6E Lighting Standards, Types 30 and 31, Base Plate Details
- ☐ ES-6F 10 Degree Lighting Standards
- ☐ ES-6H 10 Degree Lighting Standards Details
- ☐ ES-6J Signal and Lighting Standards Case 1 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 15' to 30'
- ☐ ES-6K Signal and Lighting Standards Case 2 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 20' to 30'
- ☐ ES-6L Signal and Lighting Standards Case 3 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 20' to 45'
- ☐ ES-6M Signal and Lighting Standards Case 4 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 25' to 45'
- ☐ ES-6MA Signal and Lighting Standards Case 5 Arm Loading, Wind Velocity = 70 MPH Arm Lengths 50' to 55'
- ☐ ES-6N Signal and Lighting Standards Type 40-0-80
- ☐ ES-6O Signal and Lighting Standards Case 1 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 25' to 30'
- ☐ ES-6P Signal and Lighting Standards Case 2 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 20' to 30'
- ☐ ES-6Q Signal and Lighting Standards Case 3 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 20' to 45'
- ☐ ES-6R Signal and Lighting Standards Case 4 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 25' to 45'
- ☐ ES-6RA Signal and Lighting Standards Case 5 Arm Loading, Wind Velocity = 80 MPH Arm Lengths 50' to 55'
- ☐ ES-6S Signal and Lighting Standards Details No. 1
- ☐ ES-6T Signal and Lighting Standards Details No. 2
- ☐ ES-6U Slip Base Insert for Type 10 and 15 Lighting Standards
- ☐ ES-6V Left Turn Signal and Sign Standard Type 33
- ☐ ES-7A Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-7B Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-7C Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-7D Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-7E Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-7F Signal and Lighting Details, Electrical Details Structure Installations
- ☐ ES-8 Signal and Lighting Details, Pull Box Details
- ☐ ES-9A Cantilever Flashing Beacon Details, Types 9, 9A, 9B
- ☐ ES-9B Cantilever Flashing Beacon Details, Types 9, 9A, 9B
- ☐ ES-10 Signal and Lighting Details, Isolux Diagrams
- ☐ ES-11 Signal and Lighting Details, Foundation Installations
- ☐ ES-12 Pedestrian Undercrossing Fluorescent Lighting Fixture
- ☐ ES-13 Signal and Lighting Details, Splicing Details
- ☐ ES-14 Signal and Lighting Details, Wiring Details and Fuse Ratings
- ☐ ES-15 Pedestrian Overcrossing Fluorescent Lighting Fixture

EXTINGUISHABLE MESSAGE SIGN

- ☐ ES-27A Extinguishable Message Sign, 10" Letters
- ☐ ES-27B Extinguishable Message Sign, 10" Letters
- ☐ ES-28 Extinguishable Message Sign and Flashing Beacons

SIGN LIGHTING DETAILS

- ☐ ES-29 Mercury Sign Lighting Equipment
- ☐ ES-30 38" Fluorescent Sign Lighting Equipment
- ☐ ES-32A Sign Lighting Equipment
- ☐ ES-32B Signal and Lighting Details, Sign Lighting Control
- ☐ ES-33 Internally Illuminated Street Name Sign

STANDARD PLANS LIST

(January, 1988 Edition)
Revised 7/5/88

The Standard Plan sheets indicated by a marked box are applicable to this CONTRACT NO.

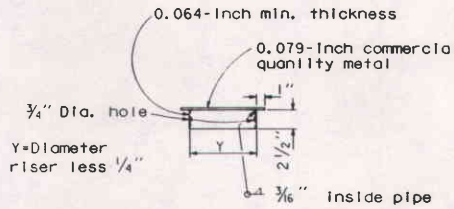
To accompany plans dated _____

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

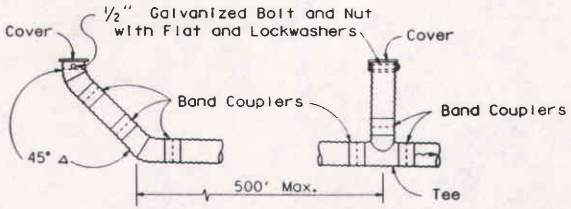
REGISTERED CIVIL ENGINEER

July 5, 1988
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
R. DeRosa
No. 12767
Exp. 3-31-89
CIVIL
STATE OF CALIFORNIA

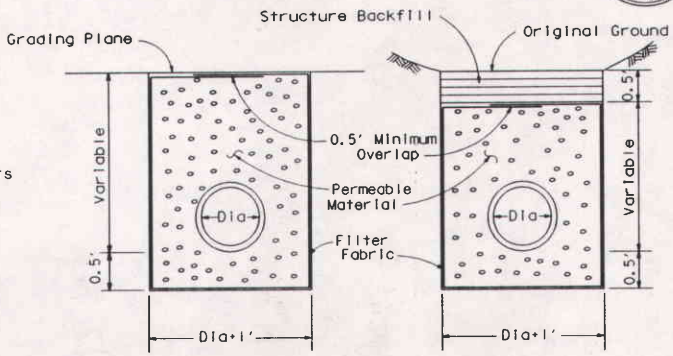


WELDED METAL COVER

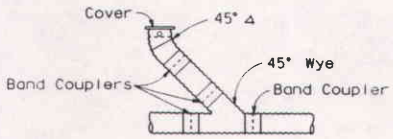


TERMINAL RISER **VERTICAL RISER**

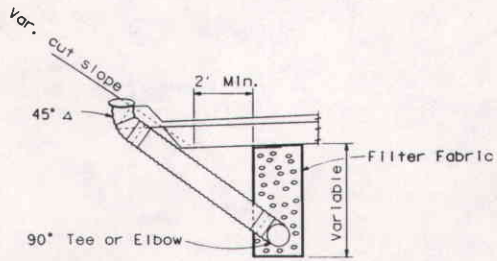
Metal pipe risers and perforated metal pipe underdrain shown. Use type of pipe specified.



EXCAVATION AND BACKFILL



45° RISER UNDERDRAIN RISERS



UNDERDRAIN LOCATION AND RISERS ANGLED TO CUT SLOPE

LEGEND

Permeable Material

Structure Backfill

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

UNDERDRAINS

REVISED STANDARD PLAN

RSP D87-C DATED JULY 5, 1988 SUPERSEDES STANDARD PLAN D87-C DATED JANUARY 4, 1988 ON PAGE 65 OF THE STANDARD PLANS BOOK DATED JANUARY, 1988.

RSP D87-C

RSP D87-C

JANUARY 1988 STANDARD PLANS BOOK

Revisions and Additions as of July 5, 1988

Date	Plan No.	Title
07-05-88	RSP D87-C	Underdrains